

WHAT IS CLAIMED IS:

1. A purified bovine uterus derived  
heparin-binding growth factor having the following  
characteristics:

5 (a) a molecular weight of about 18.9 kDa when  
analyzed in SDS-PAGE gels under reducing conditions,

(b) an amino terminal sequence

Gly-Lys-Lys-Glu-Lys-Pro-Glu-Lys-Lys-Val-Lys-Lys-Ser-Asp-  
Cys-Gly-Glu-Trp-Gln-Trp-Ser-Val-Cys-Val-Pro.

10 (c) binds to cation exchange resins and  
heparin-Sepharose,

(d) is stable to acetone precipitation,

(e) is labile in acid, and

15 (f) has potent mitogenic activity toward  
NIH 3T3 fibroblasts.

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a

1 purified and isolated

6. A DNA sequence consisting of a sequence encoding bovine heparin binding growth factor of 168 amino acids having the following amino acid sequence:

b

Met	Gln	Thr	Pro	Gln	Tyr	Leu	Gln	Gln	Arg	Arg	Lys	Phe	Ala	Ala	15
Ala	Phe	Leu	Ala	Phe	Ile	Phe	Ile	Leu	Ala	Ala	Val	Asp	<sup>Thr</sup> <del>Phe</del>	Ala	30
Glu	Ala	Gly	Lys	Lys	Glu	Lys	Pro	Glu	Lys	Lys	Val	Lys	Lys	Ser	45
Asp	Cys	Gly	Glu	Trp	Gln	Trp	Ser	Val	Cys	Val	Pro	Thr	Ser	Gly	60
Asp	Cys	Gly	Leu	Gly	Thr	Arg	Glu	Gly	Thr	Arg	Thr	Gly	Ala	Glu	75
Cys	Lys	Gln	Thr	Met	Lys	Thr	Gln	Arg	Cys	Lys	Ile	Pro	Cys	Asn	90
Trp	Lys	Lys	Gln	Phe	Gly	Ala	Glu	Cys	Lys	Tyr	Gln	Phe	Gln	Ala	105
Trp	Gly	Glu	Cys	Asp	Leu	Asn	Thr	Ala	Leu	Lys	Thr	Arg	Thr	Gly	120
Ser	Leu	Lys	Arg	Ala	Leu	His	Asn	Ala	Asp	Cys	Gln	Lys	Thr	Val	135
Thr	Ile	Ser	Lys	Pro	Cys	Gly	Lys	Leu	Thr	Lys	Ser	Lys	Pro	Gln	150
Ala	Glu	Ser	Lys	Lys	Lys	Lys	Lys	Glu	Gly	Lys	Lys	Gln	Glu	Lys	165
Met	Leu	Asp													168.

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7. The cDNA of bovine heparin-binding growth factor having the following nucleotide sequence:

GAGTGGAGAG AGTAGAAGAA AGAGAGCAGG GAGTCACCGG GCGTGCAGGG	50
GCGGAGAGCA GCGGCCGCCG CGAGCACCAG CGACTTGGGT ACCTGGACTC	100
AGGGCAGAAA AACCTCTCCC GGATCAACAA AGGCAGCCTG AGCGCGCACC	150
GCTCTTTTGC GACTCCAAAA TGCAGACTCC ACAGTACCTG CAGCAACGTC	200
GAAAATTTGC AGCTGCCTTT TTGGCATTTA TTTTCATCTT GGCAGCTGTG	250
GACACCGCTG AAGCAGGAAA GAAAGAGAAA CCAGAAAAGA AGGTGAAGAA	300
GTCTGACTGT GGAGAATGGC AGTGGAGTGT GTGTGTACCA ACCAGTGGGG	350
ACTGTGGGCT GGGCACCCGC GAGGGCACCC GTACCGGAGC TGAGTGTAAG	400
CAAACCATGA AGACCCAGAG ATGTAAGATC CCCTGCAACT GGAAAAAGCA	450
ATTTGGAGCG GAGTGCAAAT ACCAGTTCCA GGCCTGGGGA GAATGTGATC	500
TGAACACGGC TCTGAAGACC CGAACTGGGA GCCTGAAGCG AGCCCTCCAC	550
AACGCCGACT GCCAGAAGAC AGTCACCATC TCCAAGCCCT GTGGCAAGCT	600
GACCAAGTCC AAACCTCAAG CAGAATCTAA GAAGAAGAAA AAGGAAGGCA	650
AGAAACAGGA GAAGATGCTG GACTAAAAGC CACCACCTTC CGTGGACCAT	700
GAAAAGGACA TCAGCAAACA CGATCACTTA ACTATTGCAT TTATATCTAC	750
CGTAGGCTTT TTATTCAAAA ATTATCTATA GCTTAAGTAC ACAATAGGCA	800
GAAACAAAAT GAAAAGAAAA ATTTGTAGT AGCATTTTTT TTAAATGTAT	850
CAATATACCA TAGTACCACT AGGGACTTAT AATAGAGGAC TGTAATCCTA	900
TTTAGAATGT TGACTTATAG TACATGTAA GTGATAGAAA ACTGAGGTAA	950
GTTTTTTGAA GTTATGTGAT ATTTTACATT ACATTTTTTT TTACATTTTT	1000
TTCTTTTGGC AGCAATTTAA ATGTTATGAC TATGTAACT ACTTCTCTTG	1050
TTAGGTAATT TTTTTCACCT AGACTTTATT TCCCAATTGA GAAAAATATC	1100
TACTAAACAA AGCAGCAATA AAATATGATC ATCCTATCTG AGGAAAATAT	1150
CTCTTTTCT GCCAGTGGAT TTTTAAAAA TTGTAGTCAA CAAAAT	1196

2. A human placenta derived heparin-binding growth factor of 168 amino acids having the following amino acid sequence:

Met Gln Ala Gln Gln Tyr Gln Gln Gln Arg Arg Lys Phe Ala Ala 15  
Ala Phe Leu Ala Phe Ile Phe Ile Leu Ala Ala Val Asp The Ala 30  
Glu Ala Gly Lys Lys Glu Lys Phe Glu Lys Lys Val Lys Lys Ser 45  
Asp Cys Gly Glu Trp Gln Trp Ser Val Cys Val Pro Thr Ser Gly 60  
Asp Cys Gly Leu Gly Thr Arg Glu Gly Thr Arg Thr Gly Ala Glu 75  
Cys Lys Gln Thr Met Lys Thr Gln Arg Cys Lys Ile Pro Cys Asn 90  
Trp Lys Lys Gln Phe Gly Ala Glu Cys Lys Tyr Gln Phe Gln Ala 105  
Trp Gly Glu Cys Asp Leu Asn Thr Ala Leu Lys Thr Arg Thr Gly 120  
Ser Leu Lys Arg Ala Leu His Asn Ala Glu Cys Gln Lys Thr Val 135  
Thr Ile Ser Lys Pro Cys Gly Lys Leu Thr Lys Pro Lys Pro Gln 150  
Ala Glu Ser Lys Lys Lys Lys Lys Glu Gly Lys Lys Gln Glu Lys 165  
Met Leu Asp 168

3. A bovine uterus derived heparin-binding growth factor of 168 amino acids having the following amino acid sequence:

Met Gln Thr Pro Gln Tyr Leu Gln Gln Arg Arg Lys Phe Ala Ala	15
Ala Phe Leu Ala Phe Ile Phe Ile Leu Ala Ala Val Asp The Ala	30
Glu Ala Gly Lys Lys Glu Lys Pro Glu Lys Lys Val Lys Lys Ser	45
Asp Cys Gly Glu Trp Gln Trp Ser Val Cys Val Pro Thr Ser Gly	60
Asp Cys Gly Leu Gly Thr Arg Glu Gly Thr Arg Thr Gly Ala Glu	75
Cys Lys Gln Thr Met Lys Thr Gln Arg Cys Lys Ile Pro Cys Asn	90
Trp Lys Lys Gln Phe Gly Ala Glu Cys Lys Tyr Gln Phe Gln Ala	105
Trp Gly Glu Cys Asp Leu Asn Thr Ala Leu Lys Thr Arg Thr Gly	120
Ser Leu Lys Arg Ala Leu His Asn Ala Asp Cys Gln Lys Thr Val	135
Thr Ile Ser Lys Pro Cys Gly Lys Leu Thr Lys Ser Lys Pro Gln	150
Ala Glu Ser Lys Lys Lys Lys Lys Glu Gly Lys Lys Gln Glu Lys	165
Met Leu Asp	168

*purified and isolated*

4. A DNA sequence consisting of a sequence encoding human heparin binding growth factor of 168 amino acids having the following amino acid sequence:

Met Gln Ala Gln Gln Tyr Gln Gln Gln Arg Arg Lys Phe Ala Ala 15  
Ala Phe Leu Ala Phe Ile Phe Ile Leu Ala Ala Val Asp <sup>Thr</sup> ~~Thr~~ Ala 30  
Glu Ala Gly Lys Lys Glu Lys Pro Glu Lys Lys Val Lys Lys Ser 45  
Asp Cys Gly Glu Trp Gln Trp Ser Val Cys Val Pro Thr Ser Gly 60  
Asp Cys Gly Leu Gly Thr Arg Glu Gly Thr Arg Thr Gly Ala Glu 75  
Cys Lys Gln Thr Met Lys Thr Gln Arg Cys Lys Ile Pro Cys Asn 90  
Trp Lys Lys Gln Phe Gly Ala Glu Cys Lys Tyr Gln Phe Gln Ala 105  
Trp Gly Glu Cys Asp Leu Asn Thr Ala Leu Lys Thr Arg Thr Gly 120  
Ser Leu Lys Arg Ala Leu His Asn Ala Glu Cys Gln Lys Thr Val 135  
Thr Ile Ser Lys Pro Cys Gly Lys Leu Thr Lys Pro Lys Pro Gln 150  
Ala Glu Ser Lys Lys Lys Lys Lys Glu Gly Lys Lys Gln Glu Lys 165  
Met Leu Asp 168

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*a* <sup>2</sup> *purified and isolated*  
 5. The cDNA of human heparin-binding growth factor having the following nucleotide sequence:

GTCAAAGGCA GGATCAGGTT CCCC GCCTTC CAGTCCAAAA ATCCCGCCAA 50  
 GAGAGCCCCA GAGCAGAGGA AAATCCAAAG TGGAGAGAGG GGAAGAAAGA 100  
 GACCAGTGAG TCATCCGTCC AGAAGGCGGG GAGAGCAGCA GCGGCCCAAG 150  
 CAGGAGCTGC AGCGAGCCGG GTACCTGGAC TCAGCGGTAG CAACCTCGCC 200  
 CCTTGCAACA AAGGCAGACT GAGCGCCAGA GAGGACGTTT CCAACTCAAA 250  
 AATGCAGGCT CAACAGTACC AGCAGCAGCG TCGAAAATTT GCAGCTGCCT 300  
 TCTTGGCATT CATTTTCATA CTGECAGCTG TGGATACTGC TGAAGCAGGG 350  
 AAGAAAGAGA AACCAGAAAA AAAAGTGAAG AAGTCTGACT GTGGAGAATG 400  
 GCAGTGGAGT GTGTGTGTGC CCACTAGTGG AGACTGTGGG CTGGGCACAC 450  
 GGGAGGGCAC TCGGACTGGA GCTGAGTCCA AGCAAACCAT GAAGACCCAG 500  
 AGATGTAAGA TCCCCTGCAA CTGGAAGAAG CAATTTGGCG CGGAGTGCAA 550  
 ATACCAGTTC CAGGCCTGGG GAGAATGTGA CCTGAACACA GCCCTGAAGA 600  
 CCAGAACTGG AAGTCTGAAG CGAGCCCTGC ACAATGCCGA ATGCCAGAAG 650  
 ACTGTCACCA CTCCCAAGCC CTGTGGCAAA CTGACCAAGC CCAAACCTCA 700  
 AGCAGAATCT AAGAAGAAGA AAAAGGAAGG CAAGAAACAG GAGAAGATGC 750  
 TGGATTAAAA GATGTCACCT GTGGAACATA AAAAGGACAT CAGCAAACAG 800  
 GATCAGTTAA CTATTGCATT TATATGTACC GTAGGCTTTG TATTCAAAAA 850  
 TTATCTATAG CTAAGTACAC AATAAGCAAA AACAAAAAGA AAAAAAAAAA 900  
 AAAAAAAAAA AAAAAAAAAA AAAAAAAAAA AAAAAAAAAA AAAAAAAAAA 950  
 AAAAAAAAAA A 961

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